CLASS A PARTIAL DEPTH PAVEMENT REPAIRS MSP-03-06E

1.0 Description.

1.1 Class A partial depth pavement repair shall consist of repairing spalled areas or reestablishing joints or cracks in concrete pavements. Reestablishment of a joint or crack shall consist of removing concrete on each side of the joint or crack, placing a joint forming insert to reestablish the joint or crack and filling the area with concrete. This work shall be performed on concrete pavements that have not been resurfaced and are either not to be resurfaced as part of the contract work or the resurfacing is to be less than 3 inches (75 mm) thick.

1.2 If dowel bars are structurally damaged during the removal process, if the concrete below one half of the slab depth is unsound or damaged during removal, or if the area indicates pumping, movement of the subbase or structural pavement failure, full depth pavement repair shall be performed in accordance with Sec 613.

2.0 Material.

2.1 When the roadway is required to be opened to traffic within four hours of the repair, one of the following materials shall be used.

2.1.1 Concrete shall meet the following requirements. Compressive strength specimens shall be prepared in accordance with current MoDOT methods and cured to simulate actual field conditions. Testing of compressive specimens shall be performed by methods and at facilities acceptable to the engineer. A new trial mix may be required if the engineer determines the field conditions vary substantially from trial mix conditions. The coarse aggregate for the concrete shall be Gradation F in accordance with Sec 1005 or an optimized aggregate gradation approved by the engineer. The optimized aggregate gradation shall have 100 percent passing the 1/2 inch (12.5 mm) sieve, no more than five percent retained on the 3/8 inch (9.5 mm) sieve, and no more than 2.5 percent passing the No. 200 sieve.

Property	**Requirement**
Compressive Strength in 4 hours [a]	1600 psi (11 MPa), minimum
Compressive Strength in 28 days	4000 psi (28 MPa), minimum
Air Content	4.0 percent, minimum
Slump	1 inch (25 mm), maximum

[a] The cure time shall be the time determined to reach this compressive strength. The roadway may be opened to traffic when this compressive strength is attained.

2.1.2 Epoxy mortars shall be in accordance with Sec 623.

2.2 When the repair can be protected from traffic for 24 hours or more, concrete shall meet the following requirements. Coarse aggregate for the concrete shall be in accordance with Section 2.1.1.

Property	Requirement
Compressive Strength in 24 hours [a]	1600 psi (11 MPa), minimum
Compressive Strength in 28 days	4000 psi (28 MPa), minimum
Air Content	4.0 percent, minimum
Slump	1 inch (25 mm), maximum

[a] The cure time shall be the time determined to reach this compressive strength. The roadway may be opened to traffic when this compressive strength is attained.

2.3 Compressible inserts shall be rectangular and have a minimum thickness of ¼ inch (6 mm). The material shall be preformed fiber expansion joint filler in accordance with Sec 1057 or, if approved by the engineer, styrofoam or asphalt-impregnated fiberboard.

2.4 Type 2, Class B liquid membrane-forming compounds in accordance with AASHTO M 148 shall be used for curing the concrete patch material. Prior to use, the contractor shall provide to the engineer the manufacturer's certification that the curing material is in accordance with this specification.

3.0 Construction Requirements. Weather limitations shall be in accordance with Sec 502 for placement of concrete material. Any damage to the existing pavement, joints and cracks adjacent to the pavement repair, caused by the contractor's operation, shall be repaired at the contractor's expense.

3.1 Removal of Concrete. Repair limits shall extend beyond the delaminated or spalled areas by 3 to 4 inches (75 – 100 mm). Boundaries of any removal shall be kept square or rectangular. If repair areas are less than 24 inches (600 mm) apart, the areas shall be combined as one repair. The maximum amount of spalling allowed on the edges of the channel shall be 3/8 inch (9 mm). The channel depth shall not exceed half the slab depth. Concrete shall be removed by sawing and chipping or by a milling process. If the top of dowel bars are exposed but not structurally damaged, the exposed section of the dowel bar shall be coated with an approved bond breaker.

3.1.1 Sawing and Chipping. An approved saw, such as a diamond saw, shall be used to make perimeter cuts. The saw cut shall provide a vertical face at the repair edges and shall have a minimum depth of 2 inches (50 mm). Additional saw cuts may be made within the repair area to facilitate chipping removal. The repair area shall be broken out with light pneumatic tools until sound and clean concrete is exposed. The maximum allowable pneumatic hammer weight (mass) for chipping shall be 15 pounds (7 kg). The pneumatic hammer shall not be allowed to break through the concrete, and if this occurs, a full depth pavement repair shall be conducted at that location. The concrete around the repair channel shall not be broken. Once the concrete is removed, the bottom of the channel shall be flattened by removing the rocks and burrs with small pneumatic tools.

3.1.2 Milling. Milling equipment shall be in accordance with Sec 622.10. The equipment shall be equipped with a device for stopping at a preset depth. Milling may be performed either across lanes or parallel to the pavement centerline. After milling, the bottom of the repair area shall be checked by sounding to ensure all unsound material has been removed. Any unsound material remaining shall be chipped free. When milling is performed transversely to the direction of traffic, pneumatic hammers, with a maximum allowable weight (mass) of 15 pounds (7 kg), shall be used to form a vertical face where the milling machine started and ended. The

repair boundaries and edges shall be uniform. If excessive concrete is removed or if dowel bars or reinforcement are damaged to the extent to require full depth pavement repair, the cost for the repair shall be at the contractor's expense. The contractor shall remove and dispose of all residue from the grinding in a manner and at a location to satisfy environmental regulations. The contractor shall have the engineer's approval for the method of spreading and disposal of the residue prior to beginning any grinding operations. If excessive concrete is removed or if dowel bars or reinforcement are damaged to the extent to require full depth pavement repair, the cost for the repair shall be at the contractor's expense.

3.1.3 Full Depth Pavement Repair Required. If during the removal of material for partial depth pavement repair the pavement constitutes full depth pavement repair in accordance with Section 1.2, removal operations shall be stopped at that location. The contractor may conduct full depth pavement repair at that time or temporarily patch the area and perform full depth pavement repair at a later date. If the location is opened to traffic prior to the full depth pavement repair, all loose material shall be removed and either a bituminous material approved by the engineer or a concrete mixture in accordance with Section 2.0 shall be used to patch the location. Reestablishing of joints or cracks by sawing will not be required. Material provided for temporary patches shall be provided at the contractor's expense.

3.2 Cleaning. The exposed faces of the concrete shall be free of loose particles, oil, dust, traces of bituminous material and any other contaminants before repair material is placed. The procedure shall produce a clean, roughened surface, such as can be produced by sandblasting or high pressure water blasting. All residue shall be removed with air blasting equipment just prior to placement of material. The air from the air blasting equipment shall be free of contaminants.

3.3 Joint and Crack Preparation.

3.3.1 Transverse Joints and Cracks. When placing a partial depth pavement repair directly against a transverse joint or crack, a compressible insert shall be placed against the joint or crack to form a bond breaker between the patch material and joint or crack. A pliable material shall be used to reform cracks along their existing paths. The new joint or crack shall be formed to the same width as the existing joint or crack. The compressible insert shall be placed into the existing joint to a minimum depth of one inch (25 mm) below the bottom of the repair and shall extend a minimum of 3 inches (75 mm) beyond each end of the prepared repair boundaries.

3.3.2 Longitudinal and Centerline Joints. When placing a partial depth pavement repair directly against the centerline or an adjacent lane joint, a compressible insert, a thin polyethylene strip not less than 1/8 inch (3 mm) thick or asphalt impregnated roofing felt shall be placed along the joint prior to placing the patching material.

3.3.3 Shoulder Joints. When placing a partial depth pavement repair along a lane and shoulder joint, the repair edge shall be formed if the shoulder is either soil, aggregate or bituminous material. The form shall be placed even with surface and slightly below the repair depth. If the shoulder is concrete, then the repair interface at the joint shall be in accordance with Sec 3.3.2.

3.3.4 Reestablishment of Joint and Cracks. At locations where repairs include existing pavement joints, longitudinal and transverse, the initial reestablishment of the joint in the plastic concrete shall be accomplished with an approved cutter bar or preformed fiber expansion joint

filler and shall be made to the same width as the existing joint. Existing cracks shall be reestablished using a pliable compressible insert of a width equal to the existing crack width, except the insert shall be no less than ¼ inch (6 mm) thick. The material insert shall be placed into the existing joint or crack to a minimum depth of one inch (25 mm) below the bottom of the repair, shall extend the full length of the joint or crack and shall extend to the top of the proposed pavement profile. The material shall prevent the concrete from flowing into the existing joint or crack. Sawing will not be permitted.

3.4 Material Placement.

3.4.1 Bonding Material. Bonding material shall be applied in a thin even coat, shall cover the entire area, including the repair walls, shall overlap the pavement surface and shall be in accordance with the following.

3.4.1.1 For Sections 2.1.1 or 2.2 concrete, Type II or Type III epoxy resin material in accordance with Sec 1039, grout in accordance with Sec 1066, except the grout shall consist of equal parts of cement and sand, or a water mist shall be used. When epoxy material is used, the concrete shall be placed while the epoxy is still tacky. If the epoxy sets prior to placement of the concrete, the hardened epoxy material shall be removed and the pavement repair area shall be cleaned in accordance with Section 3.2. If the grout sets or dries prior to placing the concrete, the dried or hardened grout shall be removed and the pavement repair area shall be cleaned in accordance with Sec 3.2.

3.4.1.2 For epoxy mortar, a neat low viscosity epoxy in accordance with Sec 623.20 shall be used.

3.4.2 Placement of Repair Material. Epoxy mortar shall not be used to repair spalls caused by reinforcing steel corrosion. No standing water shall be present at the time of placement of the repair material. Retempering of the concrete mixture with water will not be allowed. Concrete material shall be placed into the channel and consolidated with a small spud vibrator. Vibrators with diameters greater than 1 inch (25 mm) shall not be used. Care shall be taken not to touch the compressible insert with a vibrator. On very small repairs and as approved by the engineer, hand tools may be used to work the repair material and attain adequate consolidation. Epoxy mortar components shall be handled, prepared and mixed in accordance with Sec 623. Any segregated areas shall be removed and replaced at the contractor's expense.

3.4.3 Finishing and Texturing. Repair material shall be finished to match the cross section of the existing pavement. The repair material shall be screed from the center of the repair out to the repair boundaries. Any excess mortar from finishing may be used to fill any saw cut run-outs that extend beyond the repair perimeter. After finishing, the repair shall be appropriately textured to approximate the texture of the existing pavement.

3.4.4 Sealing and Curing. The repair and slab interface shall be sealed by painting the repair perimeter with a 1:1 cement-water grout. Concrete repair material shall be cured in accordance with Sec 502.12, except a double application of curing material shall be placed over the repaired area and the curing material shall be in accordance with Sec 2.4. Epoxy mortar shall be cured in accordance with Sec 623.

3.5 Resealing Joints and Cracks . After the concrete has initial set, all longitudinal and transverse joint and crack inserts shall be removed by sawing. All joints and cracks shall be

sawed at least as wide as the rest of the joint or crack in the adjoining concrete and the underlying concrete pavement. All transverse joints and cracks shall be sawed to a minimum depth of 3/8 inch (9 mm) below the pavement surface. All longitudinal joints abutting to an adjoining concrete pavement lane shall be sawed to a depth equal to 0.5 inch (12.5 mm) less than one half of the pavement thickness. Where concrete extends into the shoulder, the saw cut shall be to the depth of the patch. The reservoir shall then be filled with a hot-poured, elastic-type concrete joint sealer in accordance with Sec 1057.

3.6 Opening to Traffic. For repairs using concrete as the patching material, traffic shall not be permitted on the repaired pavement until the minimum cure time, as determined from an approved trial mix in accordance with Sec 2.0, has elapsed and the minimum compressive strength specified for that cure time has been attained. For epoxy resin mortars or epoxy concrete, traffic shall not be permitted on the repaired pavement until the rapid set concrete has attained a minimum compressive strength of 1600 psi (11 MPa), but shall be a minimum of 2 hours after placement.

3.7 Acceptance. All pavement repairs will be sounded prior to acceptance. Sounding will not be performed until the repair material has reached design compressive strength and the repair has been open to traffic for a minimum of 30 days. If sounding indicates unsound material, the entire pavement repair shall be removed to the limits designated by the engineer and replaced by the contractor at the contractor's expense.

4.0 Method of Measurement.

4.1 Measurement for repairing spalled areas, cracks or joints will be made to the nearest 1/10 square yard (0.1 m^2). Any material removed beyond the repair area designated by the engineer due to the removal methods used by the contractor will not be included in the measurement for pavement repair. Measurement of all concrete material furnished and placed in the repair of spalled areas, cracks or joints will be made to the nearest 1/10 cubic yard (0.1 m^3). Measurement for the saw cut for resealing the joints and cracks in accordance with Section 3.5 will be made to the nearest linear foot (0.5 m).

4.2 If an area designated for partial depth pavement repair requires full depth pavement repair in accordance with Section 1.2, measurement for material removed as part of the partial depth pavement repair work at that location will be made to the nearest 1/10 square yard (0.1 m^2).

5.0 Basis of Payment. The accepted quantities for Class A partial depth pavement repair will be paid for at the contract unit price for each of the pay items listed below. No separate payment will be made for any cost associated with making perimeter saw cuts for Class A partial depth pavement repairs. Full depth pavement repairs required due to negligence by the contractor will be at the contractor's expense. All other full depth pavement repairs will be paid for in accordance with Sec 613.

613-99.03, CLASS A PARTIAL DEPTH PAVEMENT REPAIR SAW CUT(FOR RESEALING JOINTS OR CRACKS ONLY), per linear foot

613-99.05, "REMOVAL FOR CLASS A PARTIAL DEPTH PAVEMENT REPAIR ", per square yard

613-99.07, “FURNISHING AND PLACING CONCRETE MATERIAL FOR CLASS A PARTIAL DEPTH PAVEMENT REPAIR”, per cubic yard